

Application No. 09/476,910  
Response to Office Action

Customer No. 01933

Amendments to the Specification:

Please amend the paragraph at page 4, lines 10-16 as follows:

According to Jpn. Pat. Appln. KOKAI Publication No. 9-181966, an image sensed using a pair of image sensing lenses having a parallax is input, and distance information is calculated based on the information. Blur parameters including any one of the F-number, f-number, and focal ~~point~~ point position are selected to apply a blur effect.

Please amend the paragraph at page 4, line 24 to page 5, line 6 as follows:

For example, in Jpn. Pat. Appln. KOKAI Publication No. 7-21365, information about any one of the F-number, f-number, and focal ~~point~~ point position of a camera actually used to photograph an object is supplied. The blur characteristic is calculated using the set F-number, f-number, or focal ~~point~~ point position, and a new image is produced by image processing selectively using a low-pass filter and high-pass filter. However, the actual image is blurred, so no sharp image can be obtained from this image by a low-pass filter.

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Please amend the paragraph at page 5, lines 7-9 as follows:

When the camera uses a zoom lens, it is difficult to always supply information about any one of the F-number, f-number, and focal ~~pint~~ point position.

Please amend the paragraph at page 5, lines 16-26 as follows:

In Jpn. Pat. Appln. KOKAI Publication No. 9-181966, an image sensed using a pair of image sensing lenses having a parallax is input, and distance information is calculated based on the information. The blur parameter is selected to apply the blur effect. This satisfies the above requirement. However, since this blur parameter includes any one of the F-number, f-number, and focal ~~pint~~ point position, camera information is also necessary. The camera information is not compatible and general, and the blur does not give a good texture.

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Please amend the paragraph at page 7, line 27 to page 8,  
line 2 as follows:

an in-focal ~~pint~~ point position designation unit for  
designating an in-focal ~~pint~~ point position of the assumed  
image sensing optical system;

Please amend the paragraph at page 8, lines 3-7 as follows:

a blur state calculation unit for calculating a blur  
state from the distance information input by the image input  
unit, the in-focal ~~pint~~ point position designated by the  
in-focal ~~pint~~ point position designation unit, and the  
parameter input by the parameter input unit; and

Please amend the paragraph at page 9, lines 24 and 25 as  
follows:

designating an in-focal ~~pint~~ point position of the  
assumed image sensing optical system;

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Please amend the paragraph at page 9, line 26 to page 10,  
line 1 as follows:

calculating a blur state from the input distance  
information, the designated in-focal ~~pint~~ point position,  
and the input parameter; and

Please amend the paragraph at page 11, lines 6-9 as follows:

third computer-readable program means for providing the  
computer with a function of designating an in-focal ~~pint~~  
point position of the assumed image sensing optical system;

Please amend the paragraph at page 11, lines 10-14 as  
follows:

fourth computer-readable program means for providing  
the computer with a function of calculating a blur state  
from the input distance information, the designated in-focal  
~~pint~~ point position, and the input parameter; and

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Please amend the paragraph at page 12, lines 10 and 11 as follows:

FIG. 2 is a view showing the imaging state of an object before the focal ~~point~~ point position of a lens;

Please amend the paragraph at page 12, lines 20-22 as follows:

FIG. 5 is a view showing the imaging relationship of an object farther than the focal ~~point~~ point position of the lens;

Please amend the paragraph at page 13, lines 25-27 as follows:

FIG. 12 is a view showing parameter setting (step S3) of a virtual camera and setting (step S4) of a focal ~~point~~ point position shown in FIG. 8;

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Please amend the paragraph at page 16, lines 11-17 as follows:

The 3D measurement data input unit 2 means an image input unit 2 for unique physical property data having depth information in units of two-dimensional color tone data of an image. The virtual camera setting unit 3 means a parameter input unit 3, and the virtual focus setting unit 5 means an in-focal ~~pint~~ point position designation unit 5.

Please amend the paragraph at page 16, lines 18-22 as follows:

The input/output processing unit 1 has a means and function of receiving setting values from the parameter input unit 3, texture & lens setting unit 4, and in-focal ~~pint~~ point position designation unit 5 on the basis of physical property data from the image input unit 2.

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Please amend the paragraph at page 16, line 27 to page 17,  
line 3 as follows:

The parameter input unit 3, texture & lens setting  
unit 4, and in-focal ~~point~~ point position designation unit 5  
may be a keyboard or mouse, and preferably have a  
user-friendly structure using image icons.

Please amend the paragraph at page 17, lines 10-13 as  
follows:

The virtual camera parameter calculation unit 7  
converts virtual camera parameters from the parameter input  
unit 3, texture & lens setting unit 4, in-focal ~~point~~ point  
position designation unit 5, and the like.

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Please amend the paragraph at page 18, lines 19-25 as follows:

Jpn. Pat. Appln. KOKAI Publication No. 9-181966  
discloses "a method of inputting an image sensed using a pair of image sensing lenses having a parallax, calculating distance information based on the information, and selecting a blur parameter including any one of the F-number, f-number, and focal ~~point~~ point position, thereby applying a blur effect".

Please amend the paragraph at page 19, lines 25 and 26 as follows:

FIG. 2 shows the imaging state of an object in front of the focal ~~point~~ point position of the lens.



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Please amend the paragraph at page 19, line 27 to page 20,  
line 6 as follows:

Let  $f$  be the focal length of the lens,  $Z_f$  be the  
position of an object to which the focus is adjusted,  $Z_{fo}$  be  
the focal ~~point~~ point position,  $Z$  be the distance to an  
observation place,  $Z_o$  be the distance on the imaging side to  
the observation place, and  $D$  be the effective aperture of  
the lens. The origin is the center of the lens.

Please amend the paragraph at page 20, lines 25-27 as  
follows:

In FIG. 3A,  $d/D$  calculated at three focal ~~point~~ point  
positions  $Z_f = 0.3$  m, 1 m, and 10 m of a lens having  
 $f = 50$  mm are listed in the table.

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Please amend the paragraph at page 21, lines 20-22 as follows:

In FIG. 4A,  $d/D$  calculated at three focal pint point positions  $2f = 0.3$  m,  $0.6$  m, and  $2$  m of a lens having  $f = 50$  mm are listed in the table.

Please amend the paragraph at page 25, lines 1 and 2 as follows:

That is, a focal length, focal pint point position on a window, and the like are set.

Please amend the paragraph at page 32, lines 13-15 as follows:

In FIG. 11C, a near function 26 represents a blur state nearer than the in-focal pint point position, and a far function 27 represents a farther blur state.

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Please amend the paragraph at page 33, lines 9-11 as follows:

FIG. 12 shows parameter setting (step S3) of the virtual camera and setting (step S4) of the focal ~~pint~~ point position shown in FIG. 8.

Please amend the paragraph at page 33, lines 14-16 as follows:

In this example, the user can set an F-number 28 and focal ~~pint~~ point position 29 by adjusting volumes (28 and 29).

Please amend the paragraph at page 34, lines 9-11 as follows:

Calculation can be completed almost in real time for this number of pixels, and changes in F-number and focal ~~pint~~ point position can be confirmed.

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Please amend the paragraph at page 35, lines 21-25 as follows:

In the first embodiment, the focal ~~pint~~ point position is set with a volume. In the second embodiment, distance information has already been set in units of pixels. By setting a position to get into focus, the distance from it should be obtained.

Please amend the paragraph at page 36, lines 2-5 as follows:

Depth information of the head position is calculated to obtain Z, and a volume position 29 at the lower portion in FIG. 14 automatically moves to determine the focal ~~pint~~ point position.

Please amend the paragraph at page 37, lines 4-6 as follows:

The focal ~~pint~~ point position is determined using the distance to a designated pixel of the object (or the average of several pixels).

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Please amend the paragraph at page 37, lines 7-10 as follows:

When the zoom ratio is increased, an outer frame 40 within the field angle appears to display the target field angle. In this example, the focal ~~pint~~ point position appears on a volume 29.

Please amend the paragraph at page 37, lines 11-13 as follows:

If an F-number 28, the zoom 32, and the focal ~~pint~~ point position 29 are determined, expressing including a blur state is determined, and thus an image can be processed.

Please amend the paragraph at page 45, line 26 to page 46, line 1 as follows:

an in-focal ~~pint~~ point position designation means for designating the in-focal ~~pint~~ point position of the assumed image sensing optical system,

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Please amend the paragraph at page 46, lines 2-7 as follows:

a confusion circle calculation means for calculating a confusion circle from the distance information input by the image input means, the in-focal pint point position designated by the in-focal pint point position designation means, and the parameter input by the parameter input means,

Please amend the paragraph at page 47, lines 1 and 2 as follows:

the step of designating the in-focal pint point position of the assumed image sensing optical system,

Please amend the paragraph at page 47, lines 3-5 as follows:

the step of calculating a confusion circle from the input distance information, the designated in-focal pint point position, and the input parameter,

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Please amend the paragraph at page 47, line 27 to page 48,  
line 3 as follows:

a third computer-readable program means for providing  
the computer with a function of designating an in-focal ~~pint~~  
point position of the assumed image sensing optical system,

Please amend the paragraph at page 48, lines 4-8 as follows:

a fourth computer-readable program means for providing  
the computer with a function of calculating a confusion  
circle from the input distance information, the designated  
in-focal ~~pint~~ point position, and the input parameter,

Please amend the paragraph at page 50, lines 16-21 as  
follows:

Appendix (8): An image processing apparatus according  
to appendix (5) is characterized in that the blur function  
has a variable function shape, and is a concave function or  
convex function determined by a focal ~~pint~~ point position  
and an object distance to be calculated.

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Please amend the paragraph at page 51, lines 8-15 as follows:

Appendix (9): An image processing apparatus according to appendix (5) is characterized in that a user can freely change, with a volume, the F-number and a focal ~~point~~ point position designated by the user, and a calculation result using a thumbnail image obtained by thinning out an input image is displayed to interactively obtain confirmable parameter setting.

Please amend the paragraph at page 51, line 26 to page 52, line 3 as follows:

Appendix (10): An image processing apparatus according to appendix (5) or (9) is characterized in that a user designates a position on a window to determine a focal ~~point~~ point position using depth information of the window.



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Please amend the paragraph at page 52, lines 4-12 as follows:

Appendix (11): An image processing apparatus according to appendix (5) or (11) is characterized in that a user freely changes the F-number with a volume while designating a focal ~~point~~ point position on a designated window, and a calculation result using a thumbnail image obtained by thinning out an input image is displayed to interactively obtain parameter setting capable of confirming designation of the focal ~~point~~ point position and F-number.

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Please amend the paragraph at page 53, lines 16-26 as follows:

Appendix (15): An image processing apparatus according to appendix (5) is characterized in that a window is enlarged based on the central coordinates of a zoom designated by a user, a focal pint point position on the window is designated to determine the focal pint point position, the F-number is freely changed with a volume, and a calculation result using a thumbnail image obtained by thinning out an input image is displayed to interactively obtain parameter setting capable of confirming designation of the central position of the field angle, the zoom ratio, and the F-number.

Please amend the paragraph at page 58, lines 4-7 as follows:

According to the modes described in the first and fourth embodiments, it is possible to freely designate an in-focal pint point position, and thus freely blur a far view or near view.